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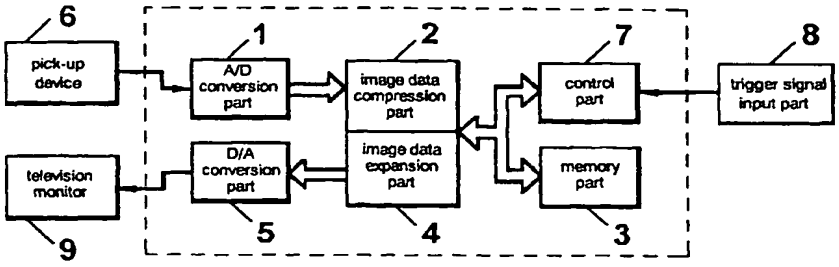
(54) Image storing/processing device

(57) There is provided an image storing/processing device in which image information is efficiently stored of an affair which may unpredictably happen at any time, and in which retrieval thereof is facilitated and further storage capacity is sharply improved. An analog video signal inputted from an external pick-up device 6 is converted to a digital video signal with an A/D conversion part 1, which digital video signal is then compressed in an image data compression part 2, and resulting compression data is stored in a memory part 3. The stored image compression data is transferred to an image data expansion part 4 and is selected and is expanded, and resulting image expansion data is convened to an analog signal in a D/A conversion part 5 and is then sent to a television monitor 9 for display thereof. A trigger signal input part 8 receives a trigger signal generated in response to the foregoing affair happening, and a control part 7 controls the operation to compress and store only a necessary image whereby the necessary image is selected and displayed on a television monitor 9. Only the necessary image is stored and is convened to compressed data in such a manner to improve storage efficiency.

Fig. 1



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Description

TECHNICAL FIELD

[0001] The present invention relates to an image storing/processing device preferable as a skip-back camera, a railroad crossing monitor, and the like.

BACKGROUND OF THE INVENTION

[0002] As means for obtaining image information of affairs which may happen at any time or image information before such affairs happen, there is known conventionally a method of using a video tape recorder. For example, a conventional railroad crossing monitor for monitoring an illegal inrush of vehicles to a railroad crossing is adopting a continuous recording system with a video tape recorder.

[0003] The aforementioned conventional method however suffers from such problems as:

(a) An image in which the affair is reflected must be retrieved from a tape to result in wasteful time and labor. (b) When the tape comes to an end, it is necessary to replace the tape, and if a user does not take care of it, then necessary image information might be frequently lost. (c) A rate of the amount of necessary data to a data amount of an entire tape used is low to result in poor efficiency. Particularly, the aforementioned conventional railroad crossing monitor has the following problems: (i) It takes time and labor to retrieve an image upon illegal inrush of vehicles from a tape. (ii) It is necessary to replace the tape routinely upon completion of recording. (iii) A rate of effective data to entire data is low because of continuous recording.

SUMMARY OF THE INVENTION

[0004] An object of the present invention is to provide an image storing/processing device in which retrieval of stored image information is achieved easily in a short time.

[0005] Another object of the present invention is to provide an image storing/processing device in which there can be efficiently stored image information of an affair such as illegal inrush of a vehicle into a railroad crossing which may happen at any time, and in which there is sharply improved a storage capacity thereof.

[0006] To achieve the above objects an image storing/processing device of the present invention comprises, as set forth in claim 1, A-D conversion means for converting a video signal from a pick-up device to a digital video signal, image compression means for compressing the digital video signal and outputting image compression data, memory means for storing the image compression data, image expansion means for selecting and expanding the image compression data stored in the memory means and outputting image expansion data, D-A conversion means for converting the image expansion data to an analog video signal, and is characterized in that said memory means has a plurality of groups of memory areas composed of memory areas divided in response to the previously set number of pages of memorizable images, and in that there is provided control means which forces the memory means to store compressed image data while updating each of the memory areas of the same group at a predetermined time interval when no trigger signal is inputted, and controls the operation such that storage location is altered to the memory area of another group in response to an input of the trigger signal.

[0007] In the above device of the present invention, said control means may monitor the amount of data of image compression by the image compression means and increase the compression rate when the above amount of data exceeds the memory capacity corresponding to one page of a picture image.

[0008] The pick-up device may include changeover means in which two sensors are installed where they can photograph a vehicle in a railroad crossing for detecting inrush of the vehicle into the railroad crossing and which generates said trigger signal with an opening/closing control signal of the crossing gate provided in the railroad crossing and the detection signals of the sensors and changing over the pick-up device with the detection signals of the sensors.

[0009] The railroad crossing monitor of the present invention comprises two pick-up devices installed where they can photograph a vehicle in a railroad crossing, a sensor for detecting inrush of a vehicle into the railroad crossing, changeover means for changing over the pick-up devices with detection signals of the sensors, A-D conversion means for convening a video signal from the pick-up device changed over by the changeover means to a digital video signal, image compression means for compressing the digital video signal and outputting image compression data, memory means for storing the image compression data, memory means for storing the image compression data, image expansion means for expanding the image compression data stored in the memory means and outputting image expansion data, D-A conversion means for converting the image expansion data to an analog video signal, and control means for generating a trigger signal with the aid of an opening/closing control signal of a crossing gate provided at the railroad crossing and the detection signals of the sensors and forcing the image compression data the memory means to store in response to the trigger signal.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010]

FIG. 1 is a block diagram illustrating the construc-

tion of one embodiment of the present invention.

FIG. 2 is an illustration describing a control method of a memory part in the above embodiment.

FIG. 3 is a block diagram illustrating one embodiment of a railroad crossing monitor device of the present invention.

FIG. 4 is an illustration of disposition of inrush of a vehicle and a television camera in the above embodiment.

FIG. 5 is an illustration of a control method of the memory part in the above embodiment in which (a) illustrates the order of updating of each memory area, and (b) illustrates timing of the order.

FIG. 6 is an illustration of generation of a trigger signal in which (A) indicates a crossing gate opening/closing control signal a, and (B) indicates a detection signal b of a sensor 46, and (C) indicates a detection signal c of a sensor 47.

DESCRIPTION OF THE PREFERRED EMBODIMENT

[0011] FIG. 1 illustrates an embodiment of an image storing/processing device according to the present invention. In the same figure, 1 designates an A/D conversion part for converting an analog video signal from an external pick-up device 6 (television camera) to a digital video signal of a brilliance signal Y and color difference signal C, 2 a JPEG (Joint Photographic Experts Group) system image data compression part for compressing the digital video signal and outputting image compression data, 3 a memory part for storing the image compression data, 4 an image data expansion part for selecting and expanding the stored image compression data from the memory part 3 and outputting image expansion data, 5 a D/A conversion part for converting the image expansion data (digital video signal) to an analog video signal, 7 a control part (microcomputer) for controlling the image compression part 2, the expansion part 4 and the memory part, 8 a trigger signal input part, 9 designates a television monitor.

[0012] In the image storing/processing device constructed as described above, an analog video signal inputted from a pick-up device 6 is converted in an A/D conversion part 1 to a digital video signal which is in turn compressed in an image data compression part 2, and resulting image compression data is stored in a memory pan 3. Stored image compression data is transferred to an image data expansion part 4, and is selected and expanded, and resulting image expansion data is converted into an analog video signal in a D/A conversion part 5 and is sent to a television monitor 9 for its display.

[0013] Herein, the trigger signal input part 8 receives a trigger signal generated in response to the aforementioned affair happening, and the control part 7 controls the operation such that only a required image is compressed and stored with the trigger signal whereby a required image is arbitrarily selected and is displayed on the television monitor 9. Only the required image is stored in such a manner and is used as compression data whereby storage efficiency is improved.

[0014] The length of the compressed image data generated by the image compression is variable. More specifically, the more complicated the input image are, the more the compression image data length increases. Accordingly, since the number of images capable of being stored in the memory part of a particular capacity is usually different in response to an input image, control of the memory part is complicated.

[0015] To solve this, in the present invention, the number of pages of images capable of being stored is previously set, and a storage area of the memory part 3 is divided equally into the set number of pages of the images. For example, as illustrated in FIG.2, the memory part 3 is divided equally into (MxN) memory areas with 1-M groups having each N memory areas arranged horizontally. The control part 7 controls such that the memory part stores the image compression data updating the respective memory areas of the first group at a predetermined time interval in the order of 1-1, 1-2, 1-3, ... 1-N, and 1-1 when no trigger signal is inputted(or when the first trigger signal is inputted), and when a trigger signal is inputted(or when the second trigger signal is inputted) the storage location for the image compression data is altered from the first group to the second group and later in serial order whereby N pages of the image compression data before the trigger signal is inputted are stored in a the memory areas of the previous group. The operation is controlled in such a manner that, when there is inputted no trigger signal, the image compression data is stored updating the respective memory areas of the same group, and the group of the memory areas is changed to the next group each time a trigger signal is inputted whereby M trigger signals are dealt with.

[0016] As described above, only the required image data can be efficiently stored taking a trigger signal input from the outside as timing of image recording by storing/processing image data as described above. Further, display of image data is arbitrarily ensured by selecting the number of the memory area of the image compression data. Further, provided the control part 7 controls the operation such that the compression rate of the image compression part 2 is increased when a data amount obtained by the image compression by the image compression part 2 is always monitored, and generated image compression data exceeds the storage capacity of the storage area corresponding to one page of the image, the number of pages of the stored images set as described above can be secured at all times. Herein, control of the aforementioned compression rate is dealt with by altering a quantized table or a scaling factor.

[0017] Furthermore, it is also possible to take the following exemplary cases by employing the aforementioned control system of such a compression rate and preparing several modes as the mode of the aforemen-

tioned set number of pages of the stored image.

[0018] For example, it is possible to divide and set those set in (M x N) memory areas at present with the compression rate of 1/2 into (M x N x 2) memory areas by increasing the compression rate of the image compression. Although the image quality is more or less deteriorated at the increased compression rate , it is considered to be enough in applications where high image quality is not required, so that the following three modes can be set by taking the high compression rate mode as an economy mode and comparing it with the case of the division into the (N x N) storage areas.

(i) high quality image mode (the storage area is divided into M (group) x (N (page))
(ii) economy mode I (the storage area is divided into M(group) x N x 2 (pages)
(iii) economy mode II (the storage area is divided into M x 2 (group) x N(page))

[0019] In what follows, there will be described one embodiment where the aforementioned image storing/processing device of the present invention is applied to a railroad crossing monitor.

[0020] FIGS. 3 and 4 illustrate a railroad crossing monitor taken as one embodiment of the present invention. In FIG. 3, 21 denotes an A/D conversion part, 22 an image data compression part, 23 a memory pan, 24 an image data expansion part, 25 a D/A conversion part, 26 a television camera changeover part, 27 a control part, 28 a trigger signal interface part, 29 a control interface part, 30, 31 input terminals for analog video signals from television cameras A, B, and 32 denotes an output terminal to a television monitor.

[0021] Further, in FIG. 4, 41, 42 designate crossing gates of railroad crossings 44, 45 for a roadway 43, and 46, 47 designate vehicle inrush detection sensors in which the television cameras A, B are disposed in the railroad crossings where vehicles S1,S2 can be photographed from front surfaces thereof. The sensors 46, 47 are disposed where they can detect an inrush of vehicles into the railroad crossings, for which there may be employed sensors using ultrasonic waves and laser light for example.

[0022] Circuit arrangement of FIG. 3 is substantially the same as that of FIG. 1, and a storing/processing operation of the circuit for image data is substantially the same. Thus, the memory part 23 for example, as illustrated in FIG. 5(a), includes memory areas A-1 to A-(2n), B -1 to B - (2n) for 2n pages of image compression data for photographed images by the television cameras A, B, and the control part 27 controls, as illustrated in FIG. 5(b), the television camera changeover part 26 to change over the television cameras A, B at a predetermined time interval and promote storage of image compression data updating the memory area.

[0023] Pages of image compression data are recorded after the sensors 46, 47 detect a vehicle in an arbitrary timing in such a manner, whereby 2n images before and after an inrush of the vehicle into the railroad crossings can be stored.

[0024] Illegal inrush of a vehicle into the railroad crossings can be detected on the basis of an opening/closing control signal from the crossing gates 41, 42 and detection signals from the sensors 46, 47. More specifically, as clarified from FIG. 6, time t from starting of lowering of the crossing gates to passage of a train can be detected on the basis of the opening/closing control signal a in FIG. (A). When the sensors 46, 47 detect the inrush of the vehicle into the railroad crossings within this time t, the illegal inrush is detected in this timing. Accordingly, provided a trigger signal s is generated on the basis of the opening/closing control signal a and the detection signals b, c in FIGs. (B), (C) in the foregoing timing which is sent to the trigger signal interface part 28,1 and the detection signals b, c from the foregoing sensors 46, 47 are sent to the television camera changeover part 26 to change output video signals from the television camera A, B and record and store an image of the illegal inrush vehicle in the foregoing timing.

[0025] It should be noted that when only an image of an illegal vehicle corresponding to one page upon inrush of the illegal vehicle is to be recorded and stored, the foregoing division of the storage area in the memory part 23 is unnecessary.

[0026] Further, provided the foregoing railroad crossing monitor device and a concentrated control center for vehicles are connected with each other through an exclusive telephone channel, presence of any illegal vehicle inrush is rapidly informed and transfer of a necessary image is ensured.

[0027] According to the present invention, as described above, when an affair which may happen at any time and when a state before and after the affair is recorded and stored with an image, only necessary image is efficiently stored also with ease of retrieval of the recorded image.

Claims

1. An image storing/processing device comprising: A-D conversion means for converting a video signal from a pick-up device to a digital video signal; image compression means for compressing said digital video signal and outputting image compression data; memory means for storing said image compression data; image expansion means for selecting the stored image compression data from the memory means for image expansion, and outputting the image compression data; and D-A conversion means for convening the image expansion data to an analog image signal, characterized in that said memory means includes a plurality of groups of memory areas divided in response to the previously set number of storable images, and in

that there is provided control means which forces the memory means to store compressed image data while updating each of the memory areas of the same group at a predetermined time interval when no trigger signal is inputted, and controls the operation such that storage location is altered to the memory area of another group in response to an input of the trigger signal.

2. An image storing/processing device according to claim 1 characterized in that said control means monitors to control said image compression means so that a compression rate of the image compression means is increased when the above amount of data exceeds the memory capacity corresponding to one page of a picture image.

3. An image storing/processing device according to claim 1 or 2 characterized in that two of said pick-up devices are installed where it can photograph vehicles in a railroad crossing, and that a sensor is provided for detecting inrush of the vehicle into the railroad crossing, and further that changeover means is provided for generating said trigger signal with an opening/closing control signal of a crossing gate provided at the railroad crossing and a detection signal from said sensor and changing over the pick-up device with a detection signal from the sensor.

4. An image storing/processing device characterized in that it comprises: two pick-up devices each installed at a position in railroad crossings where a vehicle can be photographed, a sensor for detecting inrush of a vehicle into the railroad crossings, changeover means tor changing said pick-up devices with a detection signal of said sensor, A-D conversion means for converting a video signal from the pick-up device changed over by said changeover means to a digital video signal, image compression means for compressing said digital video signal to output image compression data, memory means for storing said image compression data, image expansion means for expanding the stored image compression data stored from said memory means, D-A conversion means for convening said image expansion data to an analog video signal, and control means for generating a trigger signal with an opening/closing control signal of an crossing gate provided on a railroad crossing and the detection signal of the sensor and forcing the memory means to store said image compression data in the memory means in response to the trigger signal.

Fig. 1

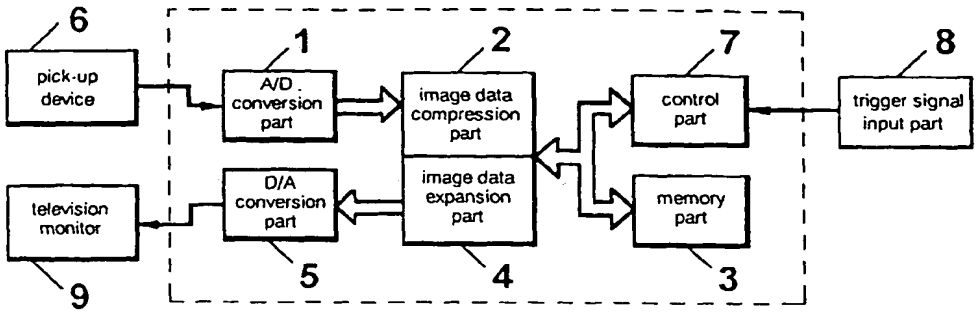

6
pick-up device
1
A/D conversion part
2
image data compression part
7
control part
8
trigger signal input part
television monitor
D/A conversion part
image data expansion part
memory part
9
5
4
3

Fig. 2

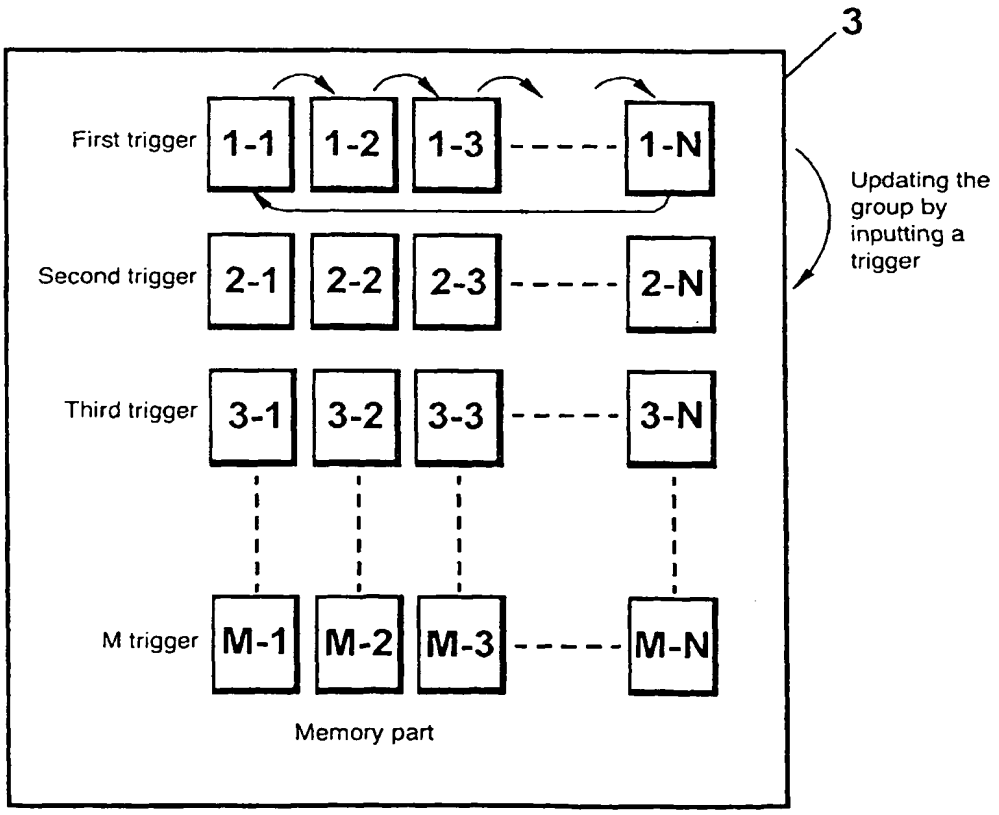

3
First trigger
1-1
1-2
1-3
1-N
Updating the group by inputting a trigger
Second trigger
2-1
2-2
2-3
2-N
Third trigger
3-1
3-2
3-3
3-N
M trigger
M-1
M-2
M-3
M-N
Memory part

Fig. 3

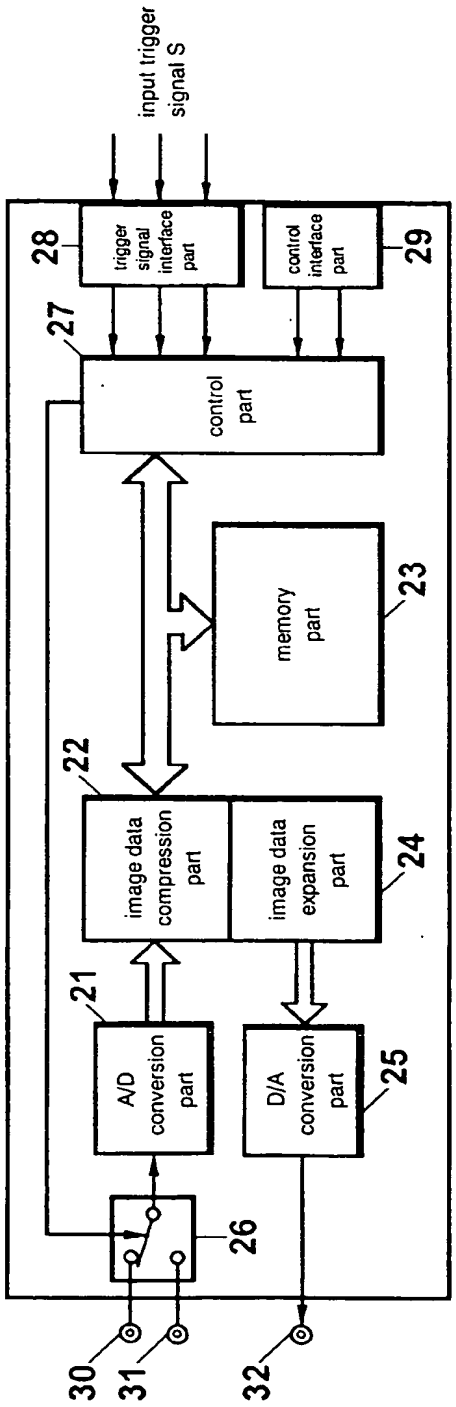

input trigger signal S
28
trigger signal interface part
control interface part
29
27
control part
memory part
23
22
image data compression part
image data expansion part
24
21
A/D conversion part
D/A conversion part
25
26
30
31
32

Fig. 4

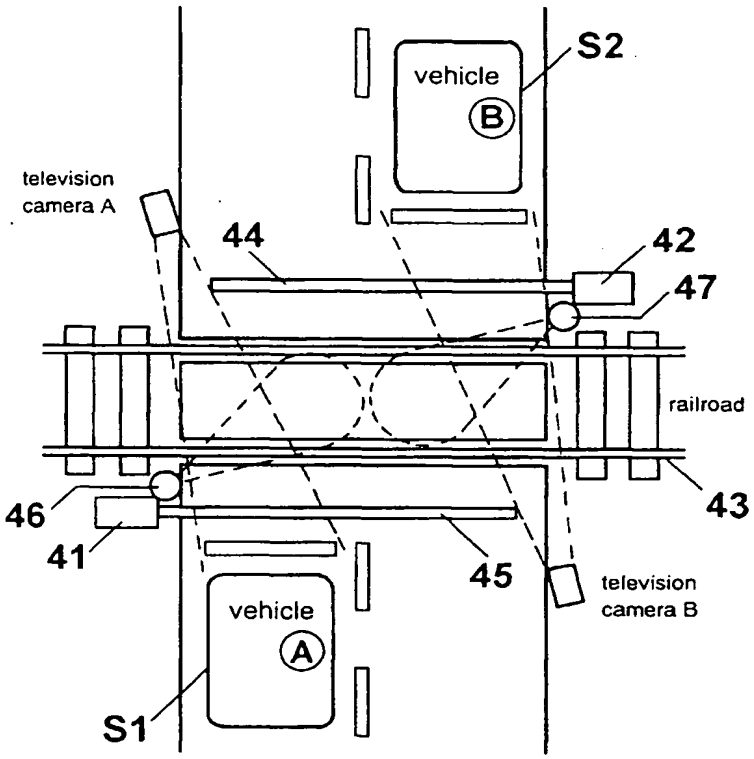

S2
vehicle
B
television
camera A
44
42
47
railroad
46
41
43
45
television
camera B
vehicle
A
S1

Fig. 5

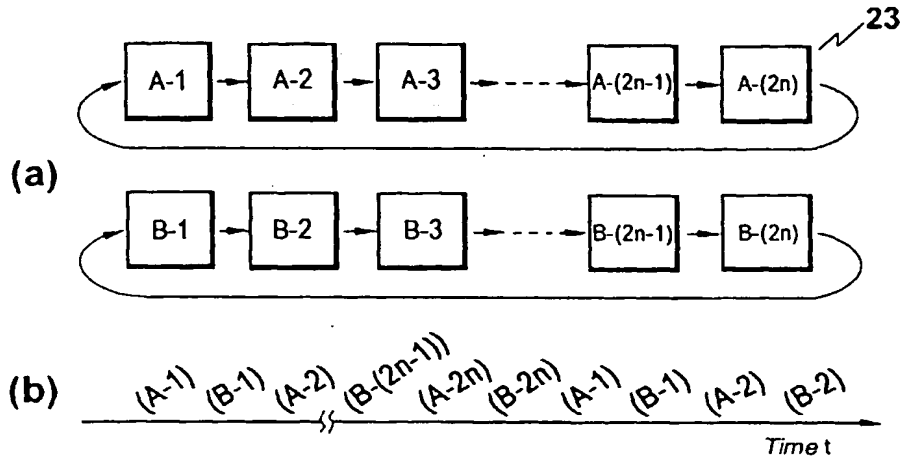
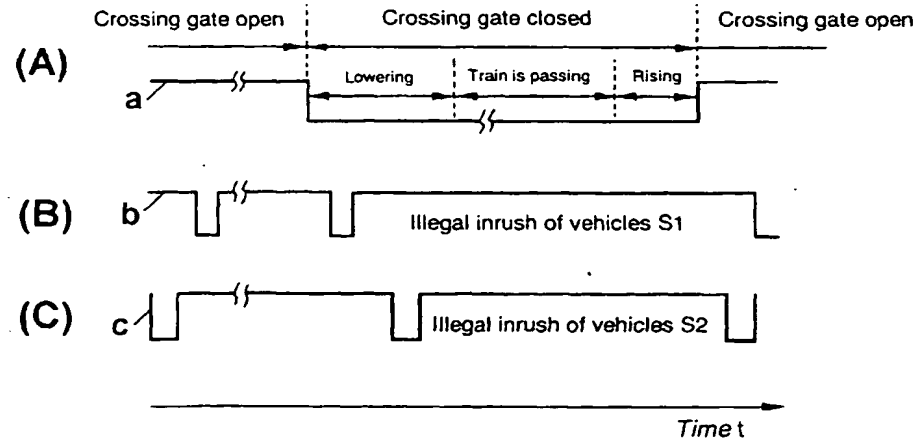

23
A-1
A-2
A-3
A-(2n-1)
A-(2n)
(a)
B-1
B-2
B-3
B-(2n-1)
B-(2n)
(b)
(A-1) (B-1) (A-2) (B-(2n-1)) (A-2n) (B-2n) (A-1) (B-1) (A-2) (B-2)
Time t

Fig. 6


Crossing gate open
Crossing gate closed
Crossing gate open
(A)
a
Lowering
Train is passing
Rising
(B)
b
Illegal inrush of vehicles S1
(C)
c
Illegal inrush of vehicles S2
Time t